PART II - EVALUATION OF POTENTIAL ENVIRONMENTAL IMPACT

3.0 OVERVIEW OF TESTING AND EVALUATION

As noted in Section 1.2.2.1, conclusions reached utilizing this manual will be used to make factual determinations of the potential effects of a proposed discharge of dredged material on the physical, chemical and biological components of the aquatic environment. Such factual determinations are used to make findings of compliance or noncompliance with relevant parts of Sections 230.10(b) (including compliance with established water quality standards) and 230.10(c) (determinations of potential contaminant-related impacts to aquatic resources).

3.1 Tiered Testing and Evaluation

The tiered approach to testing used in this manual must be initiated at Tier I. It is designed to aid in generating physical, chemical, toxicity and bioaccumulation information, but not more information than is necessary to make factual determinations. This allows optimal use of resources by focusing the least effort on disposal operations where the potential (or lack thereof) for unacceptable adverse impact is clear, and expending the most effort on operations requiring more extensive investigation to determine the potential (or lack thereof) for impact. To achieve this objective, the procedures in this manual are arranged in a series of tiers, or levels of intensity (and cost) of investigation. Tiered testing results in environmental protection in the context of more efficient completion of necessary evaluations and reduced costs, especially to low-risk operations. Disposal operations that obviously have low environmental impact generally should not require intensive investigation to make factual determinations. Evaluation at successive tiers is based on more extensive and specific information about the potential impact of the dredged material, that may be more time-consuming and expensive to generate, but that allows more and more comprehensive evaluations of the potential for environmental effects. At any tier except for Tier IV, failure to satisfactorily determine the potential for unacceptable aquatic environmental impact, or to develop sufficient information to make factual determinations, results in additional testing at a subsequent, more complex tier unless a decision is made to seek other disposal alternatives (thereby avoiding the potential for unacceptable aquatic environmental impacts).

It is necessary to proceed through the tiers only until information sufficient to make factual determinations has been obtained. For example, if the available information is sufficient to make factual determinations, no further testing is required.

The initial tier (Tier I) uses readily available, existing information (including all previous testing). For certain dredged materials with readily apparent potential for environmental impact (or lack thereof), information collected in Tier I may be sufficient for making factual determinations. However, more

extensive evaluation (Tiers II, III and IV) may be needed for other materials with less clear potential for impact or for which Tier I information is inadequate.

Tier II is concerned solely with sediment and water chemistry. Tier III is concerned with well-defined, nationally accepted toxicity and bioaccumulation testing procedures. Tier IV allows for case-specific laboratory and field testing, and is intended for use in unusual circumstances.

The approach is to enter Tier I and proceed as far as necessary to make factual determinations. Although it is not always necessary that all dredged material be evaluated through all tiers, there must be enough information available to make determinations on all aspects of the Guidelines relating to water column impact, benthic toxicity and benthic bioaccumulation. It is acceptable to carry water-column and benthic evaluations, or toxicity and bioaccumulation evaluations, to different tiers to generate the information necessary and sufficient to make these determinations.

Prior to initiating testing, it is essential that the informational requirements of preceding tiers be thoroughly understood and that the information necessary for interpreting results at the advanced tier be assembled. For example, it is always appropriate to gather all relevant available information and identify the chemicals of concern for the dredged material in question even though it may be clear without formal Tier I evaluation that further assessment will be necessary.

The tests in this manual reflect the present state-of-the-art procedures for dredged material evaluation. However, it is recognized that the evaluation of dredged material is an evolving field. It is anticipated that, as new methods of evaluation are developed and accepted, they will be integrated into the tiered framework. The tiered approach will be maintained because of the efficiency afforded by its hierarchical design.

The tiered approach used in the manual is summarized in Figure 3-1, and additional detail on water column and benthic evaluation is presented in Figures 3-2 and 3-3. These flowcharts should be used in conjunction with a careful reading of the corresponding guidance presented in this manual, in particular Sections 4, 5, 6 and 7. The sections or figures in the manual that present the technical guidance shown by the flowcharts are indicated in the boxes on the figures.

3.2 Control and Reference Sediments

It is important to clearly distinguish between control and reference sediments in the context of testing for benthic impacts. In general, control sediment is that within which the organisms resided prior to

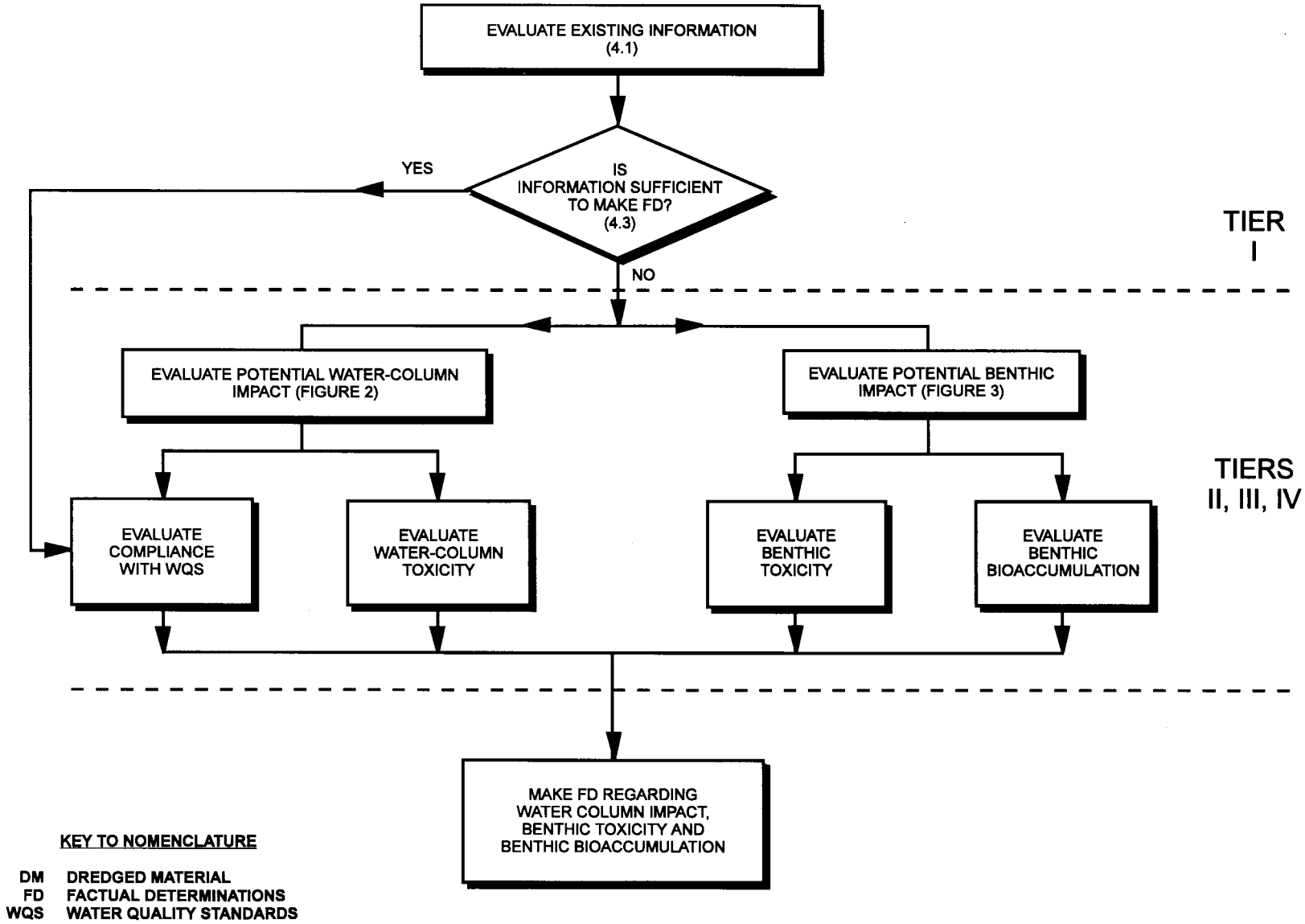


Figure 3-1. Simplified Overview of Tiered Approach to Evaluating Potential Impact of Aquatic Disposal of Dredged Material.

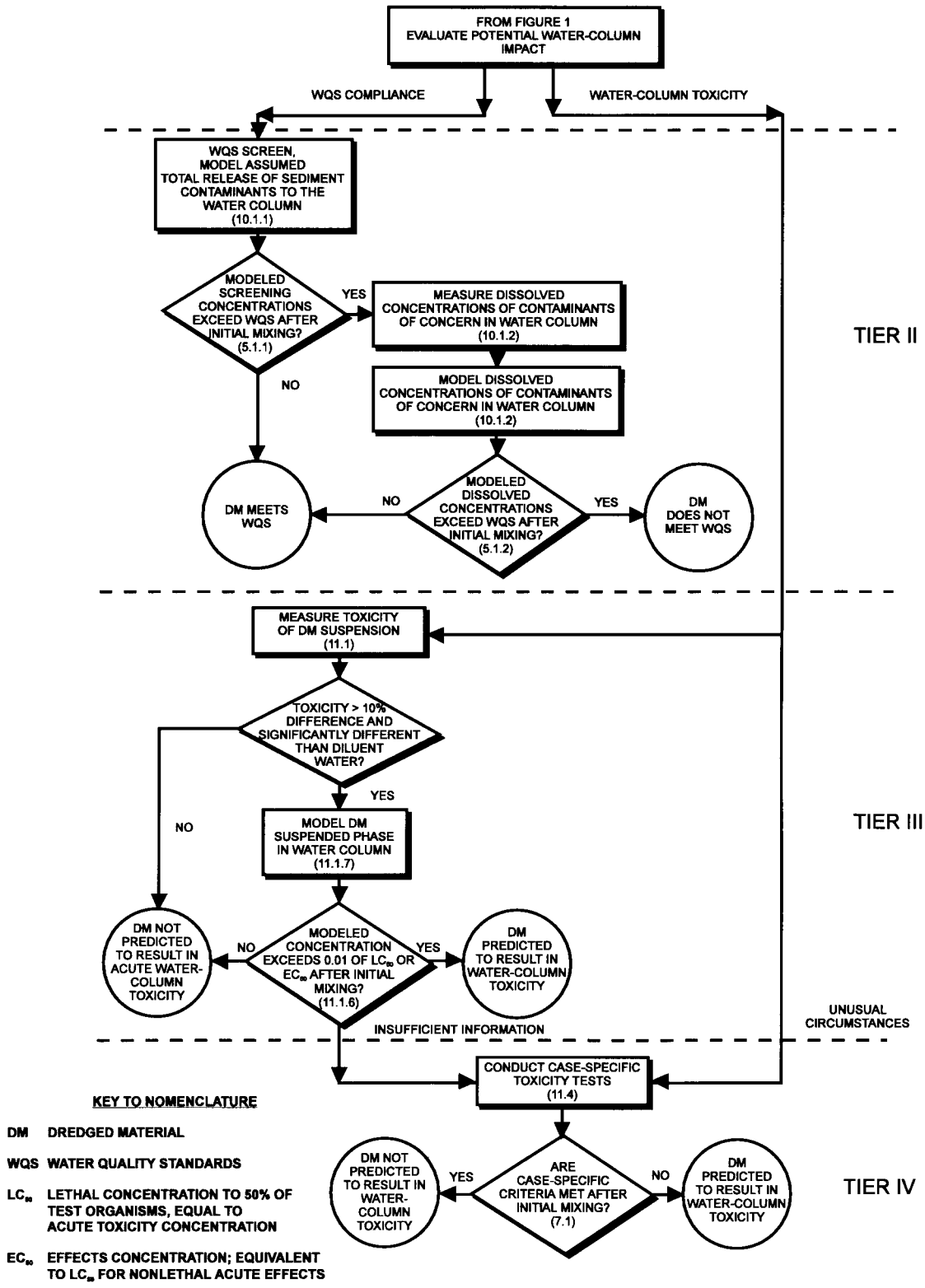


Figure 3-2. Illustration of Tiered Approach to Evaluating Potential Water Column Impacts of Dredged Material.

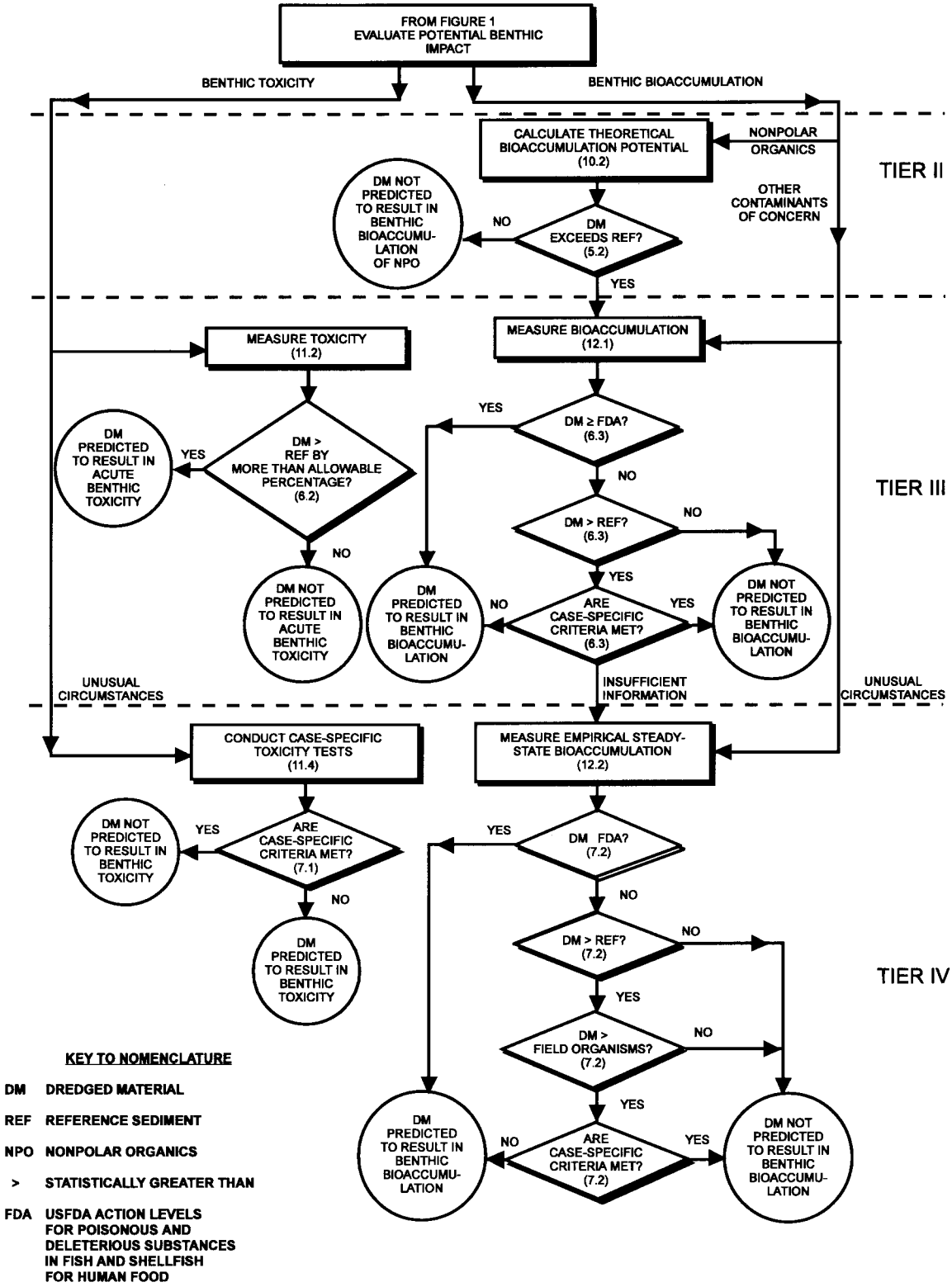


Figure 3-3. Illustration of Tiered Approach to Evaluating Potential Benthic Impacts of Deposited Dredged Material.

collection in the field or is that within which they were cultured in the laboratory, and serves to confirm the health of the test animals and the acceptability of the test conditions. Generic control sediments are also possible and consist of field-collected or laboratory prepared sediment. Reference sediment is the key to the evaluation of dredged material. Results of tests using reference sediment provide the point of comparison (reference point) to which benthic effects of dredged material are compared.

In some cases, it may be appropriate to use more than one reference sediment for a single dredging project. This could occur when the dredged material or the disposal site has a wide range of grain-sizes or TOC, when management needs suggest that disposal of different dredged materials at different locations in the disposal site is desirable, or when discharge at more than one site is being considered. One reference site can serve more than one disposal site.

3.2.1 Reference Sediment Sampling

Reference sediment is the point of comparison for evaluating test sediment. Testing requirements in the Section 404(b)(1) Guidelines regarding the point of comparison for evaluating proposed discharges of dredged material are being updated to provide for comparison to a "reference sediment" as opposed to sediment from the disposal site. Because subsequent discharges at a disposal site could adversely impact the point of comparison, adoption of a reference sediment that is unimpacted by previous discharges of dredged material will result in a more scientifically sound evaluation of potential individual and cumulative contaminant-related impacts. This change to the Guidelines was proposed in the Federal Register in January 1995, public comments have been received, and a final rule Notice is being prepared. It is expected that the final rule will be published prior to July 1, 1998, and as a result the reference sediment approach will be implemented in the ITM.

Reference sediment is generally collected outside the influence of previous disposal operations at a dredged material disposal site, but near enough to the disposal site that the reference sediment is subject to all the same influences (except previously disposed dredged material) as the disposal site. If there is a potential for sediment migration or there is a reason to believe that previously disposed sediment has migrated, reference sediment should be collected from an area that is not expected to be influenced by test material. There are four potential reference sampling approaches as discussed below. We recommend the first two reference approaches because they allow statistically valid comparisons.

Reference Point Approach: This approach is used when the disposal site is known to be sufficiently homogeneous that a single reference location is representative of the disposal site. A single reference location is sampled and the sediment is tested concurrently with the dredged material. The bioassay results from the reference sediment are statistically compared to those obtained from benthic toxicity and bioaccumulation tests of the material to be dredged.

Reference Area Approach: This approach is used when the disposal site is known to be heterogeneous and more than one reference location must be sampled to adequately characterize the disposal site. Several reference locations are sampled and a composite of all of the sediments are tested concurrently with the dredged material. The bioassay results from the reference sediment composite are statistically compared to those obtained from benthic toxicity and bioaccumulation tests of the material to be dredged.

Periodic Reference Point Approach: This approach could, theoretically, be used when it is not desirable or possible to sample the reference location each time that dredged material is to be tested. Values from the homogeneous reference location collected over a period of time are used to develop decision guidance values which are compared to those obtained from benthic toxicity and bioaccumulation tests of the material to be dredged.

Periodic Reference Area Approach: This approach could, theoretically, be used when it is not desirable or possible to sample the heterogeneous reference locations each time that dredged material is to be tested. Values from heterogeneous reference locations collected over a period of time are used to develop decision guidance values which are compared to those obtained from benthic toxicity and bioaccumulation tests of the material to be dredged.

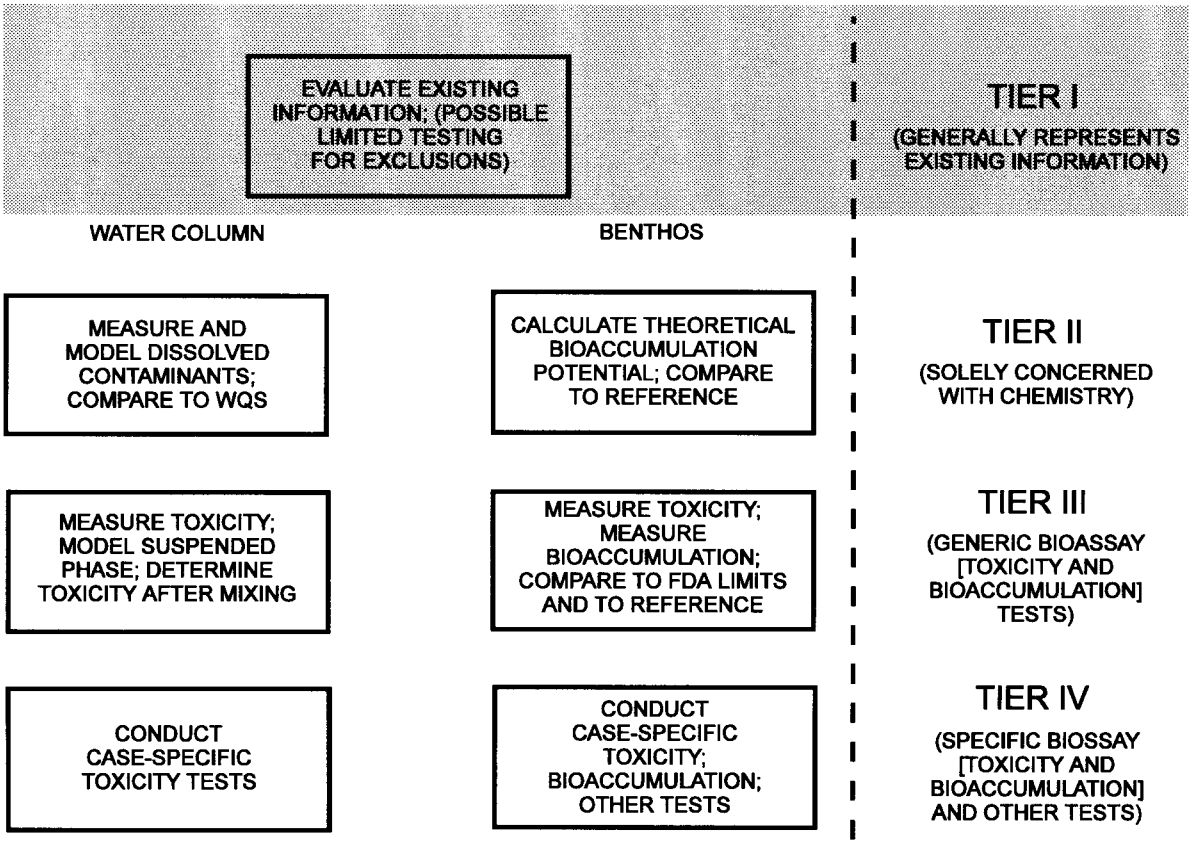
Appendix D, Statistical Methods, provides guidance for conducting statistical comparisons for the reference point and reference area approaches. It does not provide guidance for the use of either of the "periodic" approaches.

3.2.2 Reference Sediment Sampling Plan

The importance of thoughtful selection of the reference sampling approach cannot be overemphasized. To ensure that an appropriate approach is used, information gathered during the site specification process or other studies should be consulted for both the disposal and the reference sites. In some instances there are differences in the statistical methods used in comparing results from the various reference sampling methods to those obtained from the dredged material being

evaluated. There may also be differences in costs among the approaches. Prior to selecting an approach, it is imperative that Appendix D be consulted to determine which approach best fits specific concerns and conditions, including feasibility, technical validity, and cost.

A well-designed sampling plan is essential to the collection, preservation, and storage of samples so that potential toxicity and bioaccumulation can be accurately assessed (Section 8). The implementation of such a plan is equally essential for dredged material, control sediment, and reference sediment.


EVALUATE EXISTING INFORMATION; (POSSIBLE LIMITED TESTING FOR EXCLUSIONS)
TIER I
(GENERALLY REPRESENTS EXISTING INFORMATION)
WATER COLUMN
BENTHOS
MEASURE AND MODEL DISSOLVED CONTAMINANTS; COMPARE TO WQS
CALCULATE THEORETICAL BIOACCUMULATION POTENTIAL; COMPARE TO REFERENCE
TIER II
(SOLELY CONCERNED WITH CHEMISTRY)
MEASURE TOXICITY; MODEL SUSPENDED PHASE; DETERMINE TOXICITY AFTER MIXING
MEASURE TOXICITY; MEASURE BIOACCUMULATION; COMPARE TO FDA LIMITS AND TO REFERENCE
TIER III
(GENERIC BIOASSAY [TOXICITY AND BIOACCUMULATION] TESTS)
CONDUCT CASE-SPECIFIC TOXICITY TESTS
CONDUCT CASE-SPECIFIC TOXICITY; BIOACCUMULATION; OTHER TESTS
TIER IV
(SPECIFIC BIOSSAY [TOXICITY AND BIOACCUMULATION] AND OTHER TESTS)